

**Procedures and Guidelines
for Safely Performing Work
in the
Brookhaven Computer Facility**

September 12, 2007

Personal Accountability

These procedures and guidelines have been developed to protect your safety and to reduce the chance of mistakes and unintended events. Failure to comply with these procedures is grounds for immediate removal from the Brookhaven Computer Facility, may result in permanent loss of access, and possibly disciplinary action. All people allowed access to the Facility must review these procedures annually.

I have read the Procedures and Guidelines for Safely Performing Work in the Brookhaven Computer Facility and have had an opportunity to ask clarifying questions about the procedures, their reasons and their intent. I agree to follow these procedures and I will make every effort to avoid accidents and mistakes.

Name [print] _____
Signature_____ Date_____
Department [print] _____Life Number_____
Approved by_____ Date_____

Table of Contents

Requirements for Working In The Brookhaven Computer Facility (BCF)	1
1. Starting and leaving work each day	1
2. Work Planning And Control	1
Emergency Protective Systems	1
1. Fire Detection And Suppression Systems	1
2. Emergency Power Off Systems	3
Hearing Protection	3
Procedures	4
1. Safety	4
2. Doors and Partitions	4
3. Underfloor Leak Detectors	4
4. Underfloor Heat Sensors	4
5. Underfloor Halon Release Pipes	5
6. Raised Floor Tiles	5
7. Wiring and Power Distribution	6
8. Access	6
9. Card Reader Access Controls	7
General Information	7
1. Personal behavior	7
2. Prohibited Articles	7
Appendix 1. BCF Visitor Log	8

Requirements for Working In The Brookhaven Computer Facility (BCF)

1. Starting and leaving work each day
 - a. Do not set things on top of equipment or block access to any aisles, doors, air conditioning or Power Distribution Units, Emergency Power Off (EPO) buttons, chillers, or electrical panels.
 - b. Nothing may be placed within 36" in front of the door to any electrical panel, Uninterruptible Power Supply (UPS), or Power Distribution Unit (PDU).
 - c. Use safety cones, barricades, caution tape, or other safety equipment and devices to direct people away from hazardous areas. Replace all floor tiles at the end of each day.
 - d. Do not cross protective barriers or devices without asking permission. Be especially aware in areas where floor tiles can be removed exposing the underfloor area.
 - e. Unpack equipment outside the BCF if possible in order to keep combustible materials outside the computer space.
 - f. Nothing shall be stored in the computer room without permission from the BCF staff.
 - g. Nothing shall ever be stored under the raised floor.
 - h. Removing raised floor tiles creates special hazards. Be especially mindful of cabling, fire detectors, fire sprinkler heads (which can be knocked off), water leak detection systems, and other sub-floor devices and equipment. See the instructions below.
 - i. No more than the required daily quantity of paints, solvents, adhesives, or any other flammable materials needed for a job may be brought into the BCF. At no time shall the total quantity of flammable liquids exceed 5 gallons. Sealed and opened cans must be stored in metal fire rated cabinets when not in use.
 - j. Put things away at the end of the day.
 - k. Penetrations to rated fire walls or smoke barriers must be sealed on a daily basis.
2. Work Planning And Control
 - a. All work must be planned according to the requirements in the SBMS for [Work Planning and Control](#).
 - b. Each group performing significant physical work in the BCF must appoint a Work Control Coordinator. These groups include BCF Services, Unix Services, and Network Services from ITD and RHIC/ATLAS Computer Facility from the Physics Department. Other smaller groups using the BCF do not, in general, perform equipment installations and other physical work but may discuss work planning with the Work Control Coordinator for BCF Services.
 - c. The BCF manager must be notified of all work requiring formal work planning.
 - d. All work which may affect users of the BNL network must be announced using the [Outage/Maintenance Notification Form](#). It is the responsibility of the initiating group to coordinate the work with the other affected organizations.

Emergency Protective Systems

1. Fire Detection And Suppression Systems
 - a. The BCF is protected by a complicated array of fire alarm, detection and suppressant systems. For completeness all of the systems are described here. You may find that unless you think about these systems regularly you may not be able to remember all of this information in the event of an emergency. The most important thing to remember is very simple: LEAVE THE BCF BY THE NEAREST EXIT IF YOU HEAR THE FIRE ALARM OR SEE THE FLASHING STROBE LIGHTS. The BNL fire department will respond to the alarm in a few minutes and are trained to handle any emergency. DO NOT STOP TO COLLECT YOUR POSSESSIONS. JUST GET OUT.
 - b. Pre-action water sprinklers protect above the raised floor. The sprinkler system will charge with water if smoke is detected but water will not be released until the

- temperature at the sprinkler head exceeds a preset level. Every effort shall be made to prevent such a condition from ever occurring.
- c. A high sensitivity smoke detection (HSSD) system protects the RCF Linux Farm room, Supercomputer (also known as the RBRC or QCDOC) room, NYCCS (BlueGene) room, and network lab (Lab B/C). It will eventually be installed in the rest of the Brookhaven Computer Facility. HSSD is a very, very sensitive smoke detection system and provides early warning of fire which may allow trained personnel to find the source of heat (sometimes as small as a smoking resistor on a printed circuit board or an overheated motor) before it triggers the fire suppression systems. Because of the extreme sensitivity of the HSSD, soldering or any other smoke generating activity is not permitted in the BCF without first disabling the HSSD or establishing smoke control procedures (e.g. using smoke eaters). Detection of smoke by the HSSD triggers the local fire alarms and notifies the BNL fire department. It does not activate fire sprinklers or the clean agent fire suppression systems.
 - d. A Halon gaseous fire suppression system is used below the raised floor in the main room of the BCF. Halon can safely suppress a fire before the water sprinklers are activated, but must reach sufficient gas concentration to be effective. Open floor tiles can reduce the effectiveness of the Halon system. Opening in partitions under the raised floor will also allow the Halon to escape and defeat its effectiveness. Halon is released either by excessive temperatures that trigger heat sensors beneath the floor in the protected areas or by activating a manual release near the door to the loading dock on the north wall of the BCF. Activation of the Halon system will automatically notify the BNL fire department.
 - i. The Halon system will sound a very loud klaxon (buzzer) for 30 seconds before the Halon is released. Strobes lights labeled "Halon" will also flash. Immediately leave the BCF through the nearest door if you hear this alarm. Release of the Halon will make an extremely loud noise as the gas is expelled at high velocity. It may send debris flying through the room. Halon is designed to mix with the air in the underfloor space and produce a 6% concentration in air. Halon in the air will not cause noticeable effects to people below 7% concentration but may cause a tingling sensation above 7% and dizziness above 10%. As a precaution, **DO NOT REMAIN IN THE BCF AFTER A HALON RELEASE.**
 - e. A different gaseous fire suppressant agent called Inergen is used in the RCF Linux farm room, QCDOC supercomputers, the older, cylindrical RCF tape silos, and the Network room. Inergen is composed of the nontoxic gasses argon, nitrogen, and carbon dioxide (CO₂). Heat sensors in the supercomputers and tape silos and in cabinets in the network room as well as cross-zone heat detectors on the network room ceiling activate each Inergen release system as will manual release buttons on the tape silos and near the doors to the supercomputer and network rooms (fig. 1).
 - i. The Inergen system will sound a bell and cause a strobe light to flash for 30 seconds before releasing the Inergen. If you are certain that the system was triggered by a false alarm (e.g. you accidentally activated the manual release) you can abort the release by holding in the Inergen abort button. You must continue to hold this button until the system is reset by the Fire Department. It usually takes 5 minutes for the Fire Department to arrive and enter the room. This will be very unpleasant as the abort button is directly beneath the warning bell. You may choose to evacuate the area instead and allow the Inergen to release. Don't be a hero and abort the Inergen release if there is any chance that there is a fire or if you will in any way endanger yourself or others.



Fig. 1. Inergen release and abort boxes.

- ii. Release of the Inergen will expose you to the same noise and high velocity gas hazards as from Halon. Although the Inergen gas is nontoxic, the manufacturer states that you should not enter a room where Inergen has been released to suppress a fire for 15 minutes after release to avoid exposure to toxic combustion products.
 - iii. Inergen systems for the older tape robots are different. The Inergen releases are twice the concentration of the occupied areas. Follow lock out and tag out of the Inergen systems. This is considered an Oxygen Deficiency Hazard (ODH) area.
 - f. Fire rated doors must not be propped open. Leaving fire doors open can help fires to spread and can prevent fire suppressant gases from reaching sufficient concentration. Leaving doors open also affects computer room temperature, humidity stability and security.
2. Emergency Power Off Systems
- Emergency Power Off (EPO) systems are located at the exits to the supercomputer and network rooms. These buttons disable computer power to the computers in these rooms. The main room also has legacy EPO buttons near the exits. These buttons are leftovers from old systems and DO NOT DO ANYTHING.

Hearing Protection

1. Noise levels in the main room of the BCF and the RCF Linux Farm have been measured in the range of 85 to 91 dB. Entrances to these rooms have been posted with "Caution Noise Hazard" signs. People in these areas must wear hearing protection (ear muffs or foam plugs).
2. Noise levels in the NYCCS (BlueGene room), and Lab B/C, have been surveyed and are less than 85 dB. Hearing protection is not required in these areas.
3. The QCDOC room and the forensics laboratory have not been surveyed recently but past surveys indicated that noise levels are below 85 dB. Surveys will be conducted in the future. Hearing protection is not required in these areas at this time but users should watch for new warning signs that may be posted after surveys are completed.
4. Hearing protection is not required when passing quickly through a noise hazard area to a quieter room or during brief tours in accordance with BNL exposure limits for the observed noise levels.
5. All workers who use hearing protection must complete the BNL Web course Noise and Hearing Conservation available at <http://training.bnl.gov/demo/courses/index.html>.
6. The BCF manager should be notified of equipment installations that may increase noise levels so that he can arrange for new noise level measurements. This should be noted during work planning.

Procedures

1. Safety

- a. Be safe!
- b. When in doubt, ask!
- c. Be sure you thoroughly understand what you are going to do before you proceed. You may not have a second chance to correct a mistake.
- d. When in doubt be conservative!
- e. Avoid safety cones, barricades, caution tape, or other safety equipment that has been installed to guide you around hazardous areas including open floor tiles.
- f. If you are going to use smoke or vapor producing equipment (soldering, cutting/welding, open flame, spray paint, vacuum pumps with oil discharge), ask the facility manager for a review to avoid tripping the smoke detection.

2. Doors and Partitions

BCF rooms and underfloor areas are designed to divide the air conditioning and fire suppressant systems into different zones. Do not prop open any normally closed doors or open holes in the underfloor partitions without permission from the BCF manager.

3. Underfloor Leak Detectors

Underfloor leak detectors are provided to sense the presence of water (fig. 2). The detectors and, in some cases, the attached white water sensing cables, must not be lifted above the floor or they will not be able to detect the presence of water at floor level.



Fig. 2. Underfloor leak detector.

4. Underfloor Heat Sensors

Underfloor heat sensors are used to activate the fire suppressant systems (fig. 3). Do not pull any cables or do any other work beneath the raised floor that may damage the sensors unless the fire suppressant system has been deactivated in the area in which you are working. Contact the BCF staff to arrange for this. Try to do this by 4 PM the day before you plan to start your work unless it is an emergency. Also tell them when you finish your work so they can reactivate the systems.

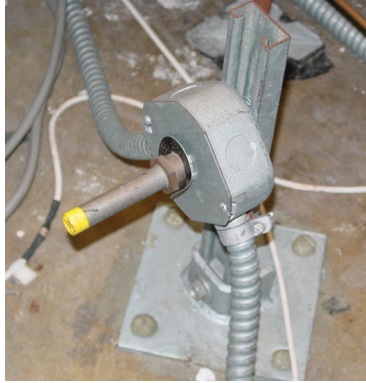


Fig. 3. Underfloor heat sensor.

5. Underfloor Halon Release Pipes

Do not do anything to block the Halon release pipes beneath the raised floor (fig. 4). Halon is released with great force and can may send objects flying.



Fig. 4. Underfloor Halon release pipe.

6. Raised Floor Tiles

- a. Remove no more than 6 raised floor tiles at any time in any one area. Make sure that all support stanchions have at least two tiles on them at all times. This will ensure maximum static pressure and structural stability of the raised floor.
- b. Close open tiles as soon as possible, no later than the end of each day. Make sure that the floor is flat and there are no raised edges to trip on when the tiles are replaced.
- c. Use safety cones, barricades, caution tape, or other safety equipment or devices to direct people away from hazardous areas, especially when a floor tile is removed and the underfloor area is open with the potential for someone to fall.
- d. Consider using masonite or plywood to protect the surface and physical strength of the raised floor from heavy computer equipment rolling spot loads.
- e. The floor tiles can bear a uniform load of 250 lbs/sq. ft. and a point load of 1000 lbs. Installation of heavy equipment will require steel reinforcement beneath the floor. The BCF manager will arrange for an engineer to design the necessary supports.
- f. Minimize the size of cable cutouts to limit the unnecessary loss of cooling air and static pressure.
- g. Cutouts in floor tiles will be protected with permanent plastic trim strips to prevent cables from rubbing against raw or rough metal edges.
- h. Replace all previously cut floor tiles no longer in use with full tiles to prevent loss of static pressure and to increase the efficiency of the cooling system.

- i. The location of perforated floor tiles, which allow cooling air to come up from under the raised floor is critical to maintaining static pressure and proper computer room cooling. The BCF staff must be consulted before rearranging perforated tiles.
- 7. Wiring and Power Distribution
 - a. Wiring refers to all materials for power, communications, signal, and control distribution including network cables and optical fibers.
 - b. All wiring shall be installed in a careful and professional manner in accordance with [BNL Environment, Safety, and Health Standards, Section 1.5.0- Electrical Safety](#), other BNL and DOE Standards, and the National Electrical Code (NEC).
 - c. Plenum rated cables shall be used for installations under the raised floor. Previously installed, non-plenum rated cables shall not be reused for new applications. PDU cables which are UL-listed for use under a raised Information Technology Equipment room floor may also be used in areas meeting the requirements of NEC 645.5D. Speak to a qualified electrical engineer for advice on this issue.
 - d. As required by the NEC, any cable which is no longer used must be removed from beneath the raised floor; cables must not be abandoned in place. Cables which are temporarily removed from service pending the installation of new equipment must be labeled and reported to the BCF facility staff.
 - e. Riser rated cables shall be used for installations within racks. Previously installed, non-riser rated cables shall not be reused for new applications.
 - f. Rack to rack connections shall be made through patch panels whenever possible.
 - g. The Telecommunications section of ITD Network Services is responsible for installing patch panels and under-floor wiring between patch panels.
 - h. The BCF staff is responsible for major wiring within ITD racks. This includes the additional cables required for new equipment. Responsible people from other groups are permitted to disconnect and reattach cables while servicing existing equipment or to add or change a small number of cables when modifying the connections to existing equipment. Each group shall decide when it is appropriate to ask for help from the BCF staff but the BCF manager shall make the final decision in case of disagreement between ITD groups.
 - i. RHIC/ATLAS Computing Facility staff are responsible for wiring within their racks. They may ask for help from the BCF staff and must follow the directions of the BCF manager if the manager determines that RHIC/ATLAS wiring is hazardous.
 - j. Underfloor AC power connections to the computer equipment must be made using twist lock connectors unless the circuit is permanently hard wired.
 - k. UPS power will be supplied by the central UPS systems in the BCF. Individual uninterruptible power supply (UPS) systems may not be installed by users without special permission from the BCF manager. Permission will usually be granted only for specialized, third part owned and installed equipment such as fire alarms that are only available complete with their own UPS. The location of all local UPS systems must be shown on a sign at the entrance to the room with the systems.
 - l. Permission must be obtained from the BCF staff to install or remove any equipment in the BCF. The staff should be told the power drawn by the equipment and any special requirements discussed.
 - m. Power distribution wiring shall only be installed by qualified electricians (referred to in BNL ES&H Standards 1.5.0 as Utility Workers).
 - n. Power distribution Unit (PDU) circuit breakers may be operated by BCF staff and electricians. Electricians shall perform all other work inside of the PDUs. Appropriate [personal protective equipment](#) (PPE) must be used.
 - o. People should be aware that nearly all racks of equipment are powered by more than one circuit breaker. All sources of electricity must be disconnected to be sure that the rack is electrically safe.
- 8. Access
 - a. Access to the BCF is limited to normal hours and emergency responses.

- b. Only workers who have read and agree to follow these rules may access the BCF unescorted. The worker must also have completed BNL's general employee training or contractor training. Contractors who have not completed contractor training must be escorted by a BNL employee (not a guest or another contractor) at all times when they are working in the BCF.
 - c. Anyone without card reader access must be escorted at all times in the BCF. The escort must fill in the individual or tour sign-in sheet located on the table near the southeast BCF door for any visitors being escorted. Appendix 1 shows the format of the sign-in sheet.
 - d. All workers with card reader access to the BCF serve as gatekeepers to the facility. They must question anyone they do not recognize or who is not wearing an ID badge. Unescorted and unauthorized visitors should be asked to leave. The BCF staff or the BNL police (x911, x2222, or 631 344-2222) may be called for help if necessary.
9. Card Reader Access Controls
- a. Data Center doors are locked and controlled by card readers. The card readers are active from approximately 6 AM to 7 PM, Monday through Friday. Call the BNL police desk at x2238 to activate the card readers if you need access after hours. Please call them back when you finish your work to deactivate the card readers again.
 - b. Ask your supervisor to email the BCF facility manager your name, life or guest number, and justification if you need access to the BCF. The facility manager will arrange with Safeguards and Security Division, through appropriate channels, for the card reader to recognize your BNL ID badge. Please be aware that ITD does not control this process and it may take a week or more to complete.
 - c. Access may be granted for normal work days only or for 24 hour access depending on the worker's needs. Access may also be granted for any or all of the following areas: main BCF doors, network room (Lab B/C), or Building 515 basement.
 - d. The ITD Building Manager has a number of temporary access cards for workers needing short term access to the BCF.
 - e. Always use the green exit buttons to unlatch the doors when leaving the BCF. Opening the doors without pressing the buttons will activate the alarm system.

General Information

- 1. Personal Behavior
 - a. All personnel shall act in a professional manner.
 - b. As in all BNL buildings, no smoking is allowed inside the data center.
 - c. Security badges shall be worn conspicuously above the waist.
- 2. Prohibited Articles
 - a. Explosives.
 - b. Dangerous weapons.
 - c. Instruments or materials likely to produce substantial injury or damage to persons or property.
 - d. Controlled substances (e.g. illegal drugs and associated paraphernalia but not prescription medicine).
 - e. Any other item prohibited by law.

ITD
Brookhaven National Laboratory
BCF Visitor-Vendor-Guest Log

8